CLAIMS

1. A router for use in routing packets over a network, the router supporting 2^n classes of service and including:

A. a plurality of input ports for receiving packets over the network;

B. a plurality of output ports for transferring packets over the network;

C. a classifier for assigning packets received by the input ports to 2^{n+m} classes of service and mapping the 2^{n+m} classes of service to the 2^n classes of service that are supported by the router, the classifier assigning to the packet one of 2^m associated levels of priority, wherein each level of priority is associated with a different probability of packet loss;

D. means for retaining the packets based on probabilities of discard associated with the 2^{n+m} classes of service; and

E. scheduling means for transferring the packets through each of the output ports based on the 2^n classes of service.

2. The router of claim 1 further including a multiple storage location buffer for retaining packets to be transferred through the output ports, the buffer linking the storage locations that contain packets in class of service per output port queues and linking available storage locations in a free queue.

3. The router of claim 2 wherein the means for retaining the packets further includes:

i. means for determining a new weighted average depth for the free queue, and

ii. means for determining a probability of discard for a given packet if the new weighted average queue depth falls below a predetermined maximum threshold associated with the class of service to which the packet is assigned.

4. The router of claim 3 wherein the discard means discards a given packet if the associated new weighted average depth for the free queue falls below a minimum threshold associated with the class of service to which the packet is assigned.

5. The router of claim 4 wherein the discard means calculates the probability of discard as $P_d = c-(m*A_{NEW})$ where c is an intercept and m is a slope that is associated with a line that plots average free queue depth versus probability of discard for the class of service to which the packet is assigned, and A_{NEW} is the new weighted average depth of the free queue.

6. The router of claim 5 wherein the discard means calculates the new weighted average depth of the free queue as $A_{NEW} = A_{CURRENT} + w(I-A_{CURRENT})$ where w is a weighting factor, I represents the instantaneous depth of the free queue and $A_{CURRENT}$ is the current weighted average depth of the free queue.

7. The router of claim 6 wherein the scheduling means selects packets for transfer based on weighting factors associated with the respective 2^n classes of service.

8. A router for use in routing packets over a network, the router supporting 2^n classes of service and including:

A. a plurality of input ports for receiving packets over the network;

B. a plurality of output ports for transferring packets over the network;

C. a multiple storage location buffer for retaining packets to be transferred through the output ports;

D. means for retaining the packets based on probabilities of discard associated with 2^{n+m} classes of service; and

E. scheduling means for transferring the packets through each of the output ports based on the 2^n classes of service that the router supports.

9. The router of claim 8 further including a classifier for:

i. assigning packets received by the input ports to 2^{n+m} classes of service,

ii. associating the packets with the 2^n classes of service that are supported by the router, and

iii. assigning to the packet one of 2^m associated levels of priority, wherein each level of priority is associated with a different probability of packet loss.

10. The router of claim 9 wherein the means for retaining the packets further includes

i. means for determining a new weighted average queue depth for a free queue that links available buffer storage locations, and

ii. means for determining a probability of discard for a given packet if the new weighted average free queue depth falls below a predetermined maximum threshold associated with the class of service to which the packet is assigned.

11. The router of claim 10 wherein the discard means calculates the probability of discard as $P_d = c-(m*A_{NEW})$ where c is an intercept and m is a slope that are associated with a line that plots average free queue depth versus probability of discard for the class of service to which the packet is assigned, and A_{NEW} is the new weighted average depth of the free queue.

12. The router of claim 11 wherein the discard means calculates the new depth of the free queue as $A_{NEW} = A_{CURRENT} + w\ (I-A_{CURRENT})$ where w is a weighting factor, I represents the instantaneous depth of the free queue and $A_{CURRENT}$ is the current weighted average depth of the free queue.

13. The router of claim 12 wherein the discard means discards a given packet if the new weighted average free queue depth falls below a minimum threshold associated with the class of service to which the packet is assigned.

14. The router of claim 12 wherein the discard means retains a given packet if the new weighted average free queue depth is above a maximum threshold associated with the class of service to which the packet is assigned.

15. The router of claim 8 wherein the scheduling means selects packets for transfer through each output port based on weighting factors associated with the respective 2^n classes of service.

16. The router of claim 15 wherein the buffer links retained packets in class of service per output port queues and the scheduling means selects packets from the class of service per output port queues.

17. A method of routing packets through a router that supports 2^n classes of service, the method including the steps of:

A. receiving packets through one or more input ports;

B. assigning packets received by the input ports to 2^{n+m} classes of service and mapping the 2^{n+m} classes of service to the 2^n classes of service that are supported by the router, the classifier assigning to the packet one of 2^m associated levels of priority, wherein each level of priority is associated with a different probability of packet loss;

C. retaining the packets based on probabilities of discard associated with the 2^{n+m} classes of service; and

D. transferring the packets through one or more output ports based on the 2^n classes of service.

18. The method of routing packets of claim 17 further including in the step of retaining the packets the steps of :

i. retaining the packets in a multiple storage location buffer and linking available storage locations to a free queue,

ii. determining a new weighted average depth for the free queue, and

iii. determining a probability of discard for a given packet if the new weighted average queue depth falls below a predetermined maximum threshold associated with the class of service to which the packet is assigned.

19. The method of routing packets of claim 18 including in the step of retaining the packets the further step of discarding a given packet if the new weighted average depth for the free queue falls below a minimum threshold associated with the class of service to which the packet is assigned.

20. The method of routing packets of claim 19 wherein the step of retaining the packets includes calculating the probability of discard as $P_d = c-(m*A_{NEW})$ where c is an intercept and m is a slope associated with a line that plots weighted average free queue depth versus probability of discard for the class of service to which the packet is assigned, and A_{NEW} is the new weighted average depth of the free queue.

21. The method of routing packets of claim 20 wherein the step of retaining the packets includes calculating the new weighted average depth of the free queue as $A_{NEW} = A_{CURRENT} + w (I-A_{CURRENT})$ where w is a weighting factor I represents the instantaneous depth of the free queue and $A_{CURRENT}$ is the current weighted average queue depth.

22. The method of claim 21 wherein the discard means retains a given packet of the new weighted average free queue depth is above a maximum threshold associated with the class of service to which the packet is assigned.

23. The method of routing packets of claim 17 wherein the step of transferring packets through the more or more output port transfers the packets based on weighting factors associated with the respective 2^n classes of service.

24. A method of routing packets through a router that supports 2^n classes of service, the method including:

A. receiving packets through one or more input ports and assigning the packets to 2^{n+m} classes of service;

B. retaining packets based on probabilities of discard associated with the 2^{n+m} classes of service in a multiple storage location buffer that links available storage locations to a free queue; and

C. transferring the packets through one or more output ports based on the 2^n classes of service.

25. The method of routing of claim 24 further including the steps:

i. associating the packets that are assigned to the 2^{n+m} classes of service with the 2^n classes of service that are supported by the router, and

ii. assigning to the respective packets one of 2^m associated levels of priority, wherein each level of priority is associated with a different probability of packet loss.

26. The method of routing packets of claim 25 wherein the step of retaining the packets includes:

a. determining a new weighted average depth for the free queue, and

b. determining a probability of discard for a given packet if the new weighted average free queue depth falls below a predetermined maximum threshold associated with the class of service to which the packet is assigned.

27. The method of routing packets of claim 26 wherein the step of retaining packets further includes calculating the probability of discard as $P_d = c-(m*A_{NEW})$ where c is an intercept and m is a slope that are associated with a line that plots average free queue depth versus probability of discard for the class of service to which the packet is assigned, and A_{NEW} is the new weighted average depth of the free queue.

28. The method of routing packets of claim 27 wherein the step of retaining packets further includes calculating the new weighted average depth of the free queue as $A_{NEW} = A_{CURRENT} + w\ (I-A_{CURRENT})$ where w is a weighting factor, I represents the instantaneous depth of the free queue and $A_{CURRENT}$ is the current weighted average queue depth.

29. The method of routing packets of claim 26 wherein the step of retaining packets further includes discarding a given packet if the new weighted average free queue depth falls below a minimum threshold associated with the class of service to which the packet is assigned.

29. The method of routing packets of claim 26 wherein the step of retaining packets further includes retaining a given packet if the new weighted average free queue depth is above the maximum threshold associated with the class of service to which the packet is assigned.